

# **Prefaces**

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## Facing Global Environment Change

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### Social Consequences of Environmental Degradation

Environmental deterioration includes a long and expanding list of major and multiple dysfunctions that feed on each other (White 1993), increasing the chain of vulnerabilities. In the specific case of land degradation and desertification, its huge economic and social costs, and ultimately, implications for peace and security, have not been given adequate recognition. There is also a common misperception that desertification is a 'natural' problem of advancing deserts in faraway developing countries. In reality, it is about the loss of the land's biological productivity. In terms of its global reach, the drylands include approximately one third of the Earth's surface and more than one hundred countries. Over 250 million people are directly affected by desertification, while one billion are at risk.

With regard to the causal chain that leads to desertification, this has been analysed at length and with different findings. The suggested causes include drought and climate change as well as human-induced factors such as over-cultivation, over-grazing and deforestation, which have to be seen in the broader context of population dynamic, poverty and external constraints imposed by the global economy. None of these causes can explain the process by itself. However, there is a strong correlation between food insecurity, poverty, population dynamic, and land degradation.

### A Challenge for Survival: Food Insecurity and Famines

The phenomenon of land degradation, desertification and drought has major bearing on the potential of the arable lands to produce adequate food for human consumption. Depending on the source or the method of calculation, it is estimated that between 40 million and 115 million people are directly affected by food insecurity. Under nourishment, however, is a much wider problem. Although the proportion of the world population affected has steadily declined, the total number of people going hungry has actually increased and is currently above 500 million persons.

The recent world food crisis has brought into the spotlights another important aspect of natural resource scarcity, namely that of endangering human rights. Many of the ongoing conflicts and crises have been considered also as results of the impact of serious drought, desertification and land degradation with rising conflict over deteriorating resources. Together with the Special UN Rapporteur on the Right to Food, the secretariat of the *United Nations Convention to Combat Desertification* (UNCCD) released a study at the 16<sup>th</sup> session of the CSD in May 2008 in New York (Ziegler/UNCCD 2008).

In several countries there is difficulty to access food due to unprecedented price hikes for commodities, but also due to emerging impacts climate change resulting in frequent and severe *desertification, land degradation and drought* (DLDD). Inflated international food prices have already led to food riots in some countries, while the most vulnerable are also seeing the food aid process being threatened by this economic context. However, available information indicates that occurrences of food shortages, hunger and malnutrition are prevalent in those regions of the

world, in South Asia and Sub-Saharan Africa, where people are least dependent on imports from the world markets. Hunger is caused in these countries not only by high international food prices, but often by local level conditions, especially rural poverty, arable land degradation, desertification and frequent droughts that result in low agricultural productivity. Most of the actual hunger takes place in the villages and in the countryside, and it persists even when international food prices are low. Food crisis grows primarily out of the low productivity of the practiced subsistence farming, mostly undertaken in inherently marginal and degraded lands, with highly unreliable rainfall, remotely located from the markets and public services and infrastructures, without improved seeds, nitrogen fertilizers and irrigation in the event of a drought.

Water availability plays a major role in determining the production and availability of food in developing countries and regions, where crop production is mostly dependent on the rainfall. Inadequate water resources availability, more often than not tends to lead to food shortages and food insecurity owing to a drop in agricultural production and famine that in turn lead to forced human migration and loss of life.

The international community should face this crisis through structural actions. Subsidizing agricultural inputs or food aid will not last. Measures on sustainable land management and soil protection must be implemented under a clear strategy of returning investments to rural areas. Developing countries, particularly those affected by drought and desertification should be encouraged and supported, to propel the expansion of domestic agricultural production through effectively reversing the processes of land degradation and desertification and returning degraded arable land to crop production, improving local level infrastructure and distribution and storage systems and removing policy distortions that discourage food production.

## **Desertification and Poverty**

Also contributing to the exacerbation of desertification is poverty, which is most prevalent among rural populations. According to the World Bank, nearly 75 per cent of the poorest populations live in rural areas, and a large majority of them depend on agriculture for daily subsistence and income. In drylands, the fragile ecosystems make it hard to accumulate a surplus in agricultural production, and poor households

are forced to extract more from their lands than can be sustained in the long term. Overexploitation and burdening of land results in the impoverishment of soils, leading to the vicious downward spiral of increasing desertification and rising poverty. Thus the poor become both the agent and the victims of land degradation and desertification.

The shrinking availability of arable land for food production, a reduced supply of safe water, a growing number of forced migrants, and conflicts induced by scarcity of natural resources or the aggravated impact of national catastrophes are all factors that shed a sharper light on the combined effects of poverty and land degradation.

## **Desertification and Migration**

The loss of livelihoods and natural resources sets in motion a train of events leading from poverty to migration to conflict, to disastrous effects. Traditional ways of life are eroded; disputes over land and natural resources arise. Sometimes, the affected populations have no choice but to leave their homes to make a living elsewhere. Uncontrolled, large-scale rural to urban migration can strain the social order in towns and cities, particularly by swelling the ranks of the urban unemployed or underemployed. Such a mass displacement of people, particularly in cases of severe food shortage, can place enormous strain on the existing social structures in recipient areas, leading to social unrest.

## **Desertification as a Threat to Security**

Increased environmental degradation, meanwhile, has enhanced the destructive potential of natural disasters and in some cases hastened their occurrence. The dramatic increase in major disasters witnessed in the last 50 years provides worrying evidence of this trend. More than two billion people were affected by such disasters in the last decade, and in the same period the economic toll surpassed that of the previous four decades combined. If climate change produces more acute flooding, heat waves, droughts and storms, this pace may accelerate. However, rarely are environmental concerns factored into security, development or humanitarian strategies.

The United Nations has a role to play in this regard. It remains the most universal institution of multilateralism and provides a forum where sovereign states can come together to share burdens, address

common problems, and seize common opportunities. Conflicts resulting from competition over scarce resources also have the potential to escalate into interstate violence. From this viewpoint, desertification is seen as a threat to national security. The perception of national security must therefore be enlarged, so as to include awareness of mounting threats to the global environment. Environmental strains that transcend national borders are already beginning to break down the boundaries of national sovereignty.

Desertification, according to the report of the Millennium Ecosystem Assessment (2005a) is one of the greatest environmental challenges and a major impediment to meeting basic human needs in drylands. With 90 per cent of the drylands population of almost two billion people living in developing countries, the report also cites desertification as “potentially the most threatening ecosystem change impacting the livelihoods of the poor.”

The *United Nations Convention to Combat Desertification* (UNCCD) has been acknowledged as a major player in achieving the MDGs, particularly with regard to the eradication of poverty. Moreover, with desertification having played a role in sparking off 10 of the last armed conflicts in arid lands (Baechler 1995), it is an example of an international treaty, which addresses a global challenge that could pose a steadily increasing threat to international security and geopolitical stability.

In a concerted effort to combat desertification and thus ensure the long-term productivity of inhabited drylands, 193 parties have now joined the UNCCD. Its aim is to promote effective action through innovative action programmes and supportive international partnerships.

Adopted in 1994, the Convention is moving towards implementation, with affected countries beginning to carry out national, sub-regional, and regional action programmes. Criteria for preparing these programmes are detailed in the treaty’s five “regional implementation annexes”: Africa, Asia, Latin America and the Caribbean, the Northern Mediterranean, and Central and Eastern Europe. Drawing on past lessons, the Convention states that these programmes must adopt a bottom-up approach. They should emphasize participation processes and the creation of an ‘enabling environment’ designed to allow local people to help themselves to reverse land degradation.

Governments remain responsible for creating this enabling environment, however, by making politically sensitive changes, such as decentralizing authority, improving land tenure systems, and empowering

women, farmers, and pastoralists. They should also closely collaborate with relevant non-governmental organizations and community based organizations in the UNCCD implementation processes. In contrast to many past efforts, these action programmes are to be fully integrated into national policies for sustainable development. They should be flexible and modified as circumstances change. Desertification can only be reversed through profound changes in local and international behaviour. Step by step, these changes will ultimately lead to sustainable land use and food security. Combating desertification, then, is really just part of a much broader objective: the promotion of sustainable development in fragile ecosystems, and the positive implications for national and international security.

Reducing the risk to security by confidence-building desertification, land degradation and drought are amongst the main threats to ecosystem change. The potential of including desertification within the security debate does not lie in merely identifying how desertification acts as a cause for instability and conflicts. Rather, the focus on desertification brings forward a new type of confidence-building measures that can effectively reduce the risks to security. A more holistic defence concept would involve supporting international agencies in focusing on food security and poverty eradication within the context of drought and scarcity of resources, as they make an important contribution in preventing conflicts. The development of a global political coalition, which abandons traditional assumptions and combines security, energy, and sustainable environmental development as well as poverty alleviation, can contribute significantly to our common objective of peace and stability.

## Desertification and Climate Change

Synergies between the UNCCD National Action Programmes, which are building bridges between development and environment policies, and the United Nations Framework Convention on Climate Change National Adaptation Programmes of Action, present a unique yet still untapped - opportunity to establish comprehensive policy instruments. Such an integrated approach to tackling desertification and climate change will have multiple benefits, especially for the poor in the world’s drylands, who are suffering most from the double blow of desertification and climate change.

Linking the activities of the two conventions rather than designing, implementing and managing climate policy separately from combating desertification makes sense from an efficiency and mainstreaming perspective. In countries with scarce financial and human resources this is particularly true. Indeed, coordinating mitigation and adaptation strategies to address aspects of climate change and desertification in one stroke is needed to facilitate the development of innovative poverty reduction strategies, strengthen the adaptation capacities of vulnerable lower income groups, and fight climate change through carbon sequestration and emission reductions.

Carbon sequestration projects in the wide expanses of dryland agro ecosystems, for example, could have significantly greater benefits than expected through soils conservation. The sequestration of carbon in these soils has the potential to counter degradation and increase the productivity and sustainability of these ecosystems. These projects could also provide significant social benefits by increasing food security, which in turn would promote better habitat conservation. Local population could therefore mitigate climate change while combating desertification and protecting biological diversity.

### **The Ten-Year Strategic Plan: Framework for Implementation of the UNCCD (2008 - 2018)**

The Ten-Year Strategic Plan and framework to enhance the implementation of the *United Nations Convention to Combat Desertification* (UNCCD) (2008–2018), adopted by its Parties at the *Conference of the Parties* (COP 8) in Madrid in September 2007, is the latest manifestation of the international community's resolve to address the problem of land degradation and desertification as a major barrier in the fight against poverty in many parts of the globe.

This UNCCD Strategy recognizes that combating *desertification, land degradation and drought* (DLDD) is a global environmental challenge, which deserves a specific momentum and strong international mobilization. This new UNCCD Strategy is to provide a global framework to support the development and implementation of action programmes and policies to prevent, control and reverse deserta-

tion/land degradation and mitigate the effects of drought.

The main objectives of the Strategy include actions to improve both the living conditions of affected populations and the conditions of affected ecosystems; to generate global benefits through effective implementation of the Convention, and to mobilize resources to support the implementation process through building effective partnerships between national and international actors.

### **Facing Environmental Change by Combating Desertification**

Desertification is a major factor contributing to global environmental change in arid and semi arid regions. It contributes to the degradation of agricultural land that becomes also scarcer due to the population dynamic. Both often result in environmental stress. Desertification is also closely linked with several human-induced natural hazards, such as drought, that often trigger famines. In some cases, both the cause (desertification) and the impact (drought, famine) have posed complex threats, challenges, vulnerabilities and risks to human and national security, confronting the affected people often with a "survival dilemma" (Brauch 2004, 2005, 2006, 2008c), either to stay on their degraded land or to move to the urban centres or to emigrate to other countries and supporting the families left behind with remittances. In a few cases these complex interactions may have contributed to conflicts with low levels of violence, in others they may have fostered cooperation within and between countries.

The UNCCD operates today in an environment, which has evolved considerably since the Convention was first negotiated and faces different opportunities and constraints. The policy environment has changed since Rio as a result of the outcome of the *World Summit on Sustainable Development* (WSSD) and the adoption of the *Millennium Development Goals* (MDGs). The newly adopted UNCCD Ten-Year strategic plan offers an historical opportunity to make a lasting contribution to the achievement of sustainable development, particularly goal number one regarding the eradication of extreme poverty and hunger.

## Box: Background information on UNCCD and on the UNCCD Secretariat in Bonn

### The Convention

In 1977 the United Nations Conference on Desertification (UNCOD) adopted a Plan of Action to Combat Desertification (PACD). The United Nations Environment Programme (UNEP) concluded in 1991 that the problem of land degradation in arid, semi-arid and dry sub-humid areas had intensified, although there were "local examples of success".

The United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992 supported an integrated approach to the problem, emphasizing action to promote sustainable development at the community level. It also called on the United Nations General Assembly to establish an Intergovernmental Negotiating Committee (INCED) to prepare, by June 1994, a Convention to Combat Desertification, particularly in Africa. In December 1992, the General Assembly agreed and adopted resolution 47/188.

The Convention was adopted in Paris on 17 June 1994 and entered into force on 26 December 1996. It is the only international legal instrument to address the issue of desertification and now counts 193 country Parties.

### The UNCCD Secretariat

The permanent Secretariat of the UNCCD was established in 1997. It has been located in Bonn, Germany, since January 1999, and moved to the new UN campus in July 2006.

The functions of the secretariat are to make arrangements for sessions of the Conference of the Parties (COP) and its subsidiary bodies established under the Convention and to provide them with services as required. One key task of the secretariat is to compile and transmit reports submitted to it.

Pursuant to the adoption of the UNCCD Ten-Year Strategic Plan (2008–2018), the Secretariat undertook a comprehensive process of corporate review and structural adjustment, which aims not only at providing enhanced substantive services to the Conference of the Parties and its subsidiary bodies, but also upgrading its analytical and knowledge-brokering functions. In this regard, the Secretariat encourages coalition building and system-wide cooperation to enhance support at all levels. It further facilitates the treatment of emerging issues, new mechanisms or legislative tools to support sustainable land management. Support to the strengthening of the scientific basis of the UNCCD process is amongst the main areas of work of the secretariat, with focus on assisting the Committee on Science and Technology to bring forth scientific and technological excellence and standard setting.

UNCCD activities are coordinated with the secretariats of other relevant international bodies and conventions, such as the UN Framework Convention on Climate Change (UNFCCC) and the Convention on Biological Diversity (CBD).

### Desertification in the world



Access to regional and country overviews at:  
<http://www.unccd.int/regional/menu.php>

### National, Sub-regional and Regional Action Programmes

National Action Programmes (NAP) are one of the key instruments in the implementation of the Convention and are strengthened by Action Programmes at Sub-regional (SRAP) and Regional (RAP) levels. National Action Programmes take a participatory approach, with direct involvement of the affected local communities. They spell out the practical steps and measures to be taken to combat desertification and to promote sustainable development in arid ecosystems.

### Youth in the UNCCD implementation processes

The UNCCD has facilitated a number of initiatives in recent years in the fight against desertification. Significant among these are 'youth and environment' projects in different parts of the world. These are seen as particularly valuable, because as the future generation, young people will manage the scarce natural resources as well as suffer the severe consequences of environmental degradation, including poverty and unemployment.

Reforestation projects undertaken by Argentina, China and Mozambique, for example, accomplish a number of objectives. While helping to preserve the environment, they also create income-generating activities for young people in areas of high unemployment. The projects also increase the capacity of these communities to implement sustainable development policies in the framework of the UNCCD National Action Programmes.

In addition, the projects have been implemented in areas where they can address the issues of poverty, land degradation, carbon sequestration and loss of biodiversity at the same time, thus strengthening synergies between the Rio Conventions on Desertification, Climate change and Biodiversity.

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## Facing Global Environment Change and Disaster Risk Reduction

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Environmental disruptions are generally recognized as an increasingly important factor of migration. The linkage between population displacement, environmental change and vulnerability to natural hazards has been a topic of growing concern to the international community. Environmental disruption is recognized as both a cause and a consequence of population movements. It is a cause when people can no longer gain a secure livelihood in their homelands and are obliged to flee, having no other alternative. It is a consequence when environmental degradation results from the mass movement of people, both in the departure and the receiving areas.

This environmental disruption can take many forms: brutal or slow-onset, natural or man-made, due to a single or cumulative change. For example, the projected impacts of drought and global warming in the drylands of Africa are overwhelmingly negative and it will have significant impacts on human livelihoods, health, water resources, agricultural production and food security, as well as nature-based tourism. If we are to succeed in ensuring environmental security in the face of great challenges to the sustainability of our planet, the United States and the European Union must firmly commit to serving as international leaders in devising and abiding by practical and appropriate multilateral approaches for preserving the environment.

People affected by well-publicized environmental disasters like the 8 October 2006 earthquake in Pakistan, the 2004 Indian Ocean tsunami or the U.S. Gulf Coast hurricanes benefit from the mobilization of private and public sector generosity and humanitarian relief. Countless millions of others around the world,

however, are uprooted by gradual environmental change like desertification, land degradation and sea level rise. Forced to move elsewhere, these displaced people receive comparatively little support such as food, tools, shelter, medical care and grants, and are not even recognized as “refugees”. There are international mechanisms to assist those fleeing wars or conflicts but there is nothing right now to deal with environmental refugees. We should prepare now, to define, accept and accommodate this new breed of ‘refugee’ within international frameworks. The term ‘environmental refugee’ must be carefully defined and distinguished from economic migrants, who depart voluntarily to find a better life but may return home without persecution. But defining an environmental refugee is a contentious issue.

People often believe that nearly all environmental disasters are disasters caused by natural hazards when in fact they are the result of human actions, such as unsustainable use of natural resources, unplanned urban growth, lack of awareness and institutional capacities, insufficient land use planning, housing, infrastructures located in hazard prone areas, ecosystem degradation, and so on. Even in the case of natural events like hurricanes, building a city like New Orleans below sea level in a known hurricane zone was a human decision that led to an environmental and human catastrophe. Worries about toxins in the environment and the costs of rebuilding will likely mean that a large percentage of people displaced from New Orleans will never move back.

Chief among the slow-moving disasters is land degradation or desertification, where croplands and pastures - because of mismanagement enhanced by

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<sup>1</sup> The copyright holder for the photo is National Geographic, Natalie Biraben and Tom Wagner SM from whom the permission has been obtained.

changing climate, - can no longer support the people that live there. Millions of people in Africa and Asia have been forced off their land, and where states cannot cope, the international community has to step in.

On the issue of environmental security, migration and disasters resulting from increased vulnerability, like so many global challenges, my duty as Director of the United Nations International Strategy for Disaster Reduction (UN/ISDR) is to ensure that those countries experiencing disasters due to vulnerability to natural hazards, particularly in the developing world, find their voice, and that their voice is heard. During the second World Conference on Disaster Reduction (WCDR, Kobe, Hyogo, Japan, 18-22 January 2005), more than 160 governments agreed on the *Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters*. The *Hyogo Framework* carries a strong commitment and ownership of governments and regional, international and non-governmental organizations to reduce the vulnerability to hazards by 2015. All relevant actors coming from different development sectors (health, education, agriculture, tourism, etc.), national disaster management systems, business sector, academic, scientific and technical support organizations have now proceeded to ensure effectiveness in translating the hopeful expectations of the *Hyogo Framework* into the practical measures at international, regional, national, and community levels, and tangible activities by which progress in disaster reduction must be measured.

The *Hyogo Framework* puts forward three strategic goals which may serve as guiding principles in any efforts to advance future education for disaster reduction. It calls for the integration of disaster risk reduction into sustainable development policies and plan-

ning; the need to develop and strengthen institutions and capacities to build resilience to hazards; and the systematic incorporation of risk reduction practices into emergency preparedness, response and recovery programmes.

Most importantly, it provides a basis that commits governments as well as regional, international, and non-governmental organizations to reduce disaster risks through a range of possible approaches and activities presented in five priority areas for action:

1. *Governance* - to ensure that disaster risk reduction is a national and local priority with strong institutional basis for implementation;
2. *Risk identification* - to identify, assess and monitor disaster risks and enhance early warning;
3. *Knowledge* - use knowledge, innovation and education to build a culture of safety and resilience at all levels;
4. Reduce underlying risk factors that increase the likelihood of disasters by involving ('mainstreaming') disaster risk awareness
5. Strengthen disaster preparedness for effective response.

To be sure, the challenges we face are vast. Today, there are millions of so-called eco-migrants who leave their homes every year because of the creeping reach of the world's deserts or the destruction of natural resources that once guaranteed jobs and a way of life. The potential for political instability from drought, famine or forced migrations as a result of desertification is enormous. Millions could be forced to flee their homes and seek new lands for agricultural production. Only by embracing global approaches in team efforts can we solve the global problems that threaten the planet and our future.



## Climate Change and Security: A Destablizing Fact of Life

*Michael Zammit Cutajar*  
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*Honorary Ambassador for Climate Change, Malta*

In his 2004 apocalyptic fiction movie *The Day After Tomorrow*, director Roland Emmerich included a touch of humour, showing inhabitants of the U.S. of a reversing of the usual migratory flow and crossing the Rio Grande southwards as they flee their freezing homeland. In his award-winning documentary *An Inconvenient Truth*, Al Gore shows a 20-foot sea-level rise sweeping in tsunami-like and engulfing Manhattan, as well as Shanghai and other mega-cities. Tongue-in-cheek humour in the one case, dramatic licence in the other no doubt – but both sending the same message: climate change will destabilize life as we know it and spread a new insecurity around the globe.

Climate change is an unequivocal fact. Human activity has been destabilizing the global climate. The resulting changes, mostly negative in their impacts on society and on ecology, are taking place faster than expected. There is an urgent need for action to contain this trend over the next two or three decades if it is to remain within manageable limits this century. Even within those limits, societies everywhere will have to take stock of the expected changes and adapt to them. Those, in a nutshell, are the messages coming to us from the world's scientists, with ever-greater force and confidence, in the fourth assessment of the Intergovernmental Panel on Climate Change (IPCC AR4 2007). That is the source of the political furore that breaks out from time to time over what is to be done, when and by whom.

Climate change has made it to Hollywood. Not only through a politician turned media star, but also through a media star turned politician: Governor Arnold Schwarzenegger has placed California where it likes to be, at the cutting edge of a new trend, in this case a political one. Indeed, the impacts of climate change and the responsibility for doing something about them are entering the strategic vision of politi-

cal leaders around the world. The effects of climate change fall preponderantly on the supply of food and water, the mainstays of life. The response to climate change is intertwined with the secure supply of energy, the heartbeat of the economy on which a decent and hopeful life depends. Sea-level rise induced by global warming will eat away at living space on low-lying islands and mega-deltas. Climate change will exacerbate natural disasters – hurricanes, floods, droughts – that disturb life, sometimes snatching it away prematurely.

How does this look in the eye of the ordinary family, living way below the political heights? It depends essentially on that family's wealth or poverty. Rich people – like rich countries – tend to believe they can buy their way out of most problems, although the altruistic among them seek to do well. For poor people, problems accumulate beyond their control. Climate change is one of these – an additional factor of stress and vulnerability in their already precarious lives. In areas of existing food and water stress – the Sahel, the Horn of Africa for example – the effect of global warming gives another push towards the decision to make the dangerous migration to the hope of a better life in distant lands. Globally, hundreds of millions of people will face that decision on account of their changing climate.

Adding all this up, climate change has come to be recognized as yet another threat to the prospect of a peaceful and relatively stable world, aggravating tensions over access to food, water and energy and over population movements. Addressing climate change is now an unavoidable part of the continuing struggle by governments and people to make our world a better place.

What is the cause of the problem? We all are. From the exhaust of the luxury limousine to the wood fire inside an impoverished hut, from the rotting

waste of the consumer society to the exhalations of a subsistence rice paddy, much of human activity contributes to the accumulation of gases in the atmosphere that have kicked off a warming trend, departing from the temperature pattern of the previous millennia. This human impact – known as the greenhouse effect – has been a by-product of demographic and economic growth since the start of the industrial era. But clearly an ethical distinction needs to be drawn between the emissions of plenty and those of poverty.

Thus, the historical responsibility for human-induced climate change is not evenly distributed. The countries now riding high on global prosperity account for the bulk of accumulated emissions of greenhouse gases, in aggregate and per capita, with the U.S.A. at the top of the heap. It is they that have the responsibility and the capacity to take the lead in changing technologies and consumption patterns so that prosperity may be enjoyed with less damage to the environment.

But reality is not black-and-white. Even if the presently rich countries were to wave their technological wands and conjure up 'zero emission' life-styles, climate change would continue to be fuelled by the economic growth of the developing world unless technological change is wrought there too. The populous powerhouses of the emerging world – notably China and India – run on dirty fuels using old technologies. The avarice of power combines with the desperation of poverty to strip tropical forests that could otherwise serve to absorb greenhouse gases naturally. In showing the climate-friendly way ahead, the rich world must also provide financial and technological

incentives for the rest to follow. And support must be provided, in a spirit of solidarity, to the vulnerable people and countries least able to cope with and adapt to the impacts of climate change.

For 20 years, the protection of the global climate has been on the international agenda. It was my country, Malta, that brought the issue to the United Nations in 1988. Since that time, the IPCC has been working to provide regular assessments of the science of climate change and its impacts. The world's governments have set up a framework for cooperation: the 1992 UN Framework Convention on Climate Change (UNFCCC) and its 1997 Kyoto Protocol. The latter, aiming to start off the reduction of greenhouse gas emissions by the industrialized countries, has been hindered by its rejection by the current President of the USA.

But the year 2007 has brought new encouraging signs. The confirmation of the Stern Review that prevention is better than cure – the finding that investing now in curbing greenhouse emissions will cost much less than repairing climatic impacts *ex post* – has sent a very strong and positive message around the world's capitals and boardrooms. This has been reinforced by the vigour of the IPCC's latest findings. With the European Union in the vanguard, the year 2007 has seen a resurgence of efforts to launch a multilateral attack on climate change with all the major players on board, developed and developing. There are now high hopes of a new global deal by 2009. Although negotiated with other concerns in mind, this will make an important contribution to enhancing global security.



## Facing and Coping with Globalization: How Ten Years of WTO have Created an Agrarian Crisis in India

Vandana Shiva<sup>1</sup>

### WTO: An anti-democratic Agenda Beyond Trade

The *World Trade Organization* (WTO) came into existence as an outcome of the Uruguay Round of the *General Agreement on Trade and Tariffs* (GATT). The Uruguay Round changed the definition of trade dramatically. In the pre-WTO period, international trade rules governed trade in goods outside national borders. The WTO became an undemocratic instrument for interference into domestic economies, and it did not just change the nature of trade but the nature of production, and social and political patterns through which societies govern themselves. Trade and commerce were disembodied from society and democracy. New issues introduced in the Uruguay Round such as intellectual property, food and agriculture, services and investment are actually redesigning society to suit corporate interests without the consent of the people.

Global trade rules, as enshrined in the WTO's *Agreement on Agriculture* (AOA) and in the *Trade Related Intellectual Property Rights* (TRIPs) agreement, are primarily rules of robbery, camouflaged by arithmetic and in legal terms. In this economic hijack, the corporations gain, and people and nature loose. During the Uruguay Round, India led the resistance against the introduction of new issues. The Uruguay Round was concluded through a non-negotiated, take-it-or-leave-it text drafted by Arthur Dunkel, the then Director General of WTO.

The global reach of corporations to take over the resources of the poor of the Third World is made possible not just by reduction and removal of tariffs, one of the goals of the WTO. It is facilitated by the re-

moval of ethical and ecological limits on what can be owned as private property and what can be traded. The WTO's overall goal of promoting 'market competition' serves two functions. Firstly, it transforms all aspects of life into commodities for sale. Culture, biodiversity, food, water, livelihoods, needs and rights are all transformed and reduced to markets. In this way, globalization is completing the project of colonization that led to the conquest and ownership of land and territory. Biological resources and water, the very basis of life's processes, are being colonized, privatized, and commoditized.

Agriculture, which is still the primary livelihood for three quarters of humanity and two thirds of India, and which is as much a cultural activity as an economic one, is also threatened by 'trade liberalization', driven both by the structural adjustment programmes of the World Bank and the IMF, and by the WTO's *Agreement on Agriculture*. The globalization of food and agriculture systems, in effect, means the corporate take-over of the food chain, the erosion of food rights, the destruction of the cultural diversity of food and the biological diversity of crops, and the displacement of million from land-based, rural livelihoods.

### WTO Disputes: Dismantling People's Rights to Seeds and Food

Two of the earliest WTO disputes were brought by the U.S against India. The first was the TRIPs dispute which forced India to change its patent laws, the second was the QR (quantitative restrictions on imports) dispute, which forced India to remove its protection against dumping and cheap imports.

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1 The copyright holder for the photo is Nic Paget-Clarke <<http://www.inmotionmagazine.com/shiva.html>>.

## TRIPS and Seed Monopolies

To understand the flaws of TRIPS, it is important to know that this agreement is essentially the globalization of Western patent laws that historically have been used as instruments of conquest. The word 'patents' derives from 'letters patent' – the open letters granted by European sovereigns to conquer foreign lands or to obtain import monopolies. Christopher Columbus derived his right to the conquest of the Americas through the letter patent granted to him by Queen Isabel and King Ferdinand of Spain.

The US Patent Laws are based on the takeover of knowledge. One outcome was that broad patents were granted in the US for steamboats – in spite of the steam engine having been invented and patented by James Watt in Scotland fifteen years before.

The US has continued to ignore the pre-existence and use of inventions in other countries when granting patents. Thus, paradoxically, a legal system aimed at preventing 'intellectual piracy' is itself based on legitimizing piracy. This system is codified in Section 102 of the US Patent Act of 1952, which denies patents for inventions that are in use in the US but allows patents for inventions in use in other countries unless they have been described in a publication. If somebody in Europe was operating a machine and you, in good faith, independently and without knowledge of its existence, developed your own invention of essentially the same machine, that fact would not prevent you from obtaining a patent in the US.

In addition, the US has created unilateral instruments such as clause Special 301 in its Trade Act to force other countries to follow its patent laws. Thus, a country that depended on borrowed knowledge for its own development of industrial power has acted to block such transfer of knowledge and technology to other countries.

## Introduction of TRIPS

During the Uruguay Round of the GATT, the US introduced its flawed patent system into the WTO, and thus imposed it on the rest of the world. U.S corporations have admitted that they drafted and lobbied on behalf of TRIPS. As a Monsanto spokesman said "The industries and traders of world commerce have played simultaneously the role of patients, the diagnosticians, and prescribing physicians."

TRIPS not only made *Intellectual Property Rights* (IPR) laws global geographically, but also removed ethical boundaries by including life forms and biodi-

versity into patentable subject matter. Living organisms and life forms that are self-creating were thus re-defined as machines and artefacts made and invented by the patentee. IPRs and patents then give the patent holder a monopolistic right to prevent others from making, using or selling seeds. Seed saving by farmers has now been redefined from a sacred duty to a criminal offence of stealing 'property'. Article 27.3 (b) of the TRIPS agreement, which relates to patents on living resources, was basically pushed by the 'Life Science' companies to establish themselves as 'lords of life'.

The chemical companies of the world have bought up seed and biotechnology companies and reorganized themselves as life science corporations, claiming patents on genes, seeds, plants and animals. Ciba Geigy and Sandoz have combined to form Novartis, Hoechst has joined with Rhone Poulenc to form Aventis, Zeneca has merged with Astia, Dupont has bought up Pioneer HiBred, and Monsanto now owns Cargill seeds, DeKalb, Calgene, Agracetus, Delta and Pine Land, Holden and Asgrow. Eighty per cent of all genetically engineered seeds planted are Monsanto's 'intellectual property'. And Monsanto owns broad species patents on cotton, mustard, soya bean – crops that were not 'invented' or 'created' by Monsanto but have been evolved over centuries of innovation by farmers of India and East Asia working in close partnership with biodiversity gifted by nature.

The disastrous impact of WTO in creating seed monopolies has already been felt in India. India's 1970 patent act has been amended three times and there is an attempt to introduce a new seed law which would destroy biodiversity and farmers rights. The epidemic of farmer's suicide is the real barometer of the stress under which Indian agriculture and Indian farmers have been put by globalization of agriculture. Growing indebtedness and increasing crop failure are the main reasons that the farmers have committed suicide across the length and breadth of rural India. The suicides by farmers highlights these high social and ecological costs of the globalization of non-sustainable agriculture which are not restricted to the cotton growing areas of these states but have been experienced in all commercially grown and chemically farmed crop in all regions. While the benefits of globalization go to the seeds and chemical corporation through expanding markets, the cost and risks are exclusively born by the small farmers and landless peasants.

Globalization and privatization of the seed sector have eroded farmers seed supply and seed supplied by

the public sector. While the entry of private seed companies is justified on grounds of increasing farmers options and choices, by making farmers look down on their own varieties as inferior and by eroding the capacity of the public sector, globalization has in effect created a seed famine. Monopolies have contributed to farmers suicides as we analyse in our report *Seeds of Suicides*. As a consequence of the farmers' suicides and high seed costs, the Andhra Pradesh Government brought a case against Monsanto / Mahyco before the *Monopolies and Restrictive Trade Practises Commission* (MRTPC).

Monsanto enjoys a monopoly on production, supply and marketing of Bt. Cotton seed in India. The firm operates through its subsidiary - Mahyco. From the last few years, the company has been charging a 'trait value' (price fixed for research and development on Bt. Cotton seed, which can resist local pests) at Rs. 1750 per pack of 450 grams of seed. The multinational corporation (MNC) gets the seed for Rs. 300 per pack of 750 grams from the farmers who grow it under the company's supervision. The government has challenged the validity of the 'trait value' in the court and demanded its abolition. The government has also demanded Rs. 400 crore from the company, which it collected from the farmers.

The MRTPC directed the Mahyco-Monsanto to reduce the 'trait value' to a reasonable extent. The MNC tried to approach the Supreme Court to stay the order of the MRTPC. But, the apex court refused to grant a stay. Meanwhile, the Andhra Pradesh Government had convened a meeting of the seven other states - Orissa, Karnataka, Maharashtra, Tamil Nadu, Madhya Pradesh, Punjab and Haryana. It was decided in the meeting to bring pressure on Monsanto to reduce the price of Bt. Cotton seed so that farmers are not overburdened by the exorbitant price. The Andhra Pradesh Government's contention is that the high price of the Bt. Cotton seed is one of the reasons for distress among farmers. More than 2000 farmers committed suicide in the last eight years in Andhra Pradesh alone and most of them were cotton growers.

In a parliamentary debate the government admitted the more than 100,000 farmers had committed suicide in the last decade. Rising costs of seeds and other inputs, combined with falling prices of agricultural commodities are the primary cause of indebtedness and indebtedness is the primary cause of farmer's suicide. Both the rise in costs of production and decline in prices of farm produce are driven by the trade liberalization rules of WTO.

## AOA, Renewal of QR's and Falling Farm Prices

All over the world, structural adjustment and trade liberalization have already driven millions of farmers off the land because of rising costs of production and collapsing prices of commodities. Instead of supporting policies that help farmers survive, WTO rules are driving small farmers to extinction and ensuring that agriculture is controlled by global corporations.

The AOA of the WTO is a rule-based system for trade liberalization of agriculture that was pushed by the US in the Uruguay Round of the GATT. However, these rules are the wrong rules for protecting food security, nature and culture. Instead, they are perfectly shaped for the objective of corporate rule over our food and agriculture systems. The AOA rules apply to countries, even though it is not countries for their farmers that engage in global trade in agriculture but global corporations like Cargill. These firms gain from every rule that marginalizes farmers by removing support from agriculture. They gain from every rule that deregulates international trade, liberalizes exports and imports, and make restrictions of exports and imports illegal. Market openings through the AOA are therefore market openings for the Cargills and Monsantos.

The outcome of negotiations for the AOA should not be surprising, because global agribusiness corporations had tremendous influence on the negotiations. In fact, the U.S delegation was led by Clayton Yeutter, a former Cargill employee. There are three components to the AOA

- Domestic Support
- Market Access
- Export Competition

The WTO dispute to remove QR's was the means to get across to India's markets. However, since the rich countries subsidize their agriculture up to \$ 400 billion annually, removal of import restrictions amounts to removing the protection against cheap imports and dumping. As a result of subsidies, prices of agricultural commodities have been falling worldwide.

The crisis in cotton is an example of the agrarian crisis created by globalization. The worst suicides are taking place in the cotton belts of Vidharbha, Andhra Pradesh, Karnataka and Punjab. More than 70 countries globally produce and export cotton. Of these, eight countries are responsible for almost 80 per cent of global output. The world's cotton market is dominated by the US, - which is the second largest pro-

Commodity	1988	1995	1997	2000	2001 (Jan.)	Percent Change 2001 over 1995
Wheat (US HW)	167	216	142	130	133	-38.2
Wheat (US RSW)	160	198	129	102	106	-46.5
Wheat (Argentina)	145	218	129	112	118	-45.9
Maize (Argentina)	116	160	133	88	80	-50.0
Maize (U.S)	118	159	112	97	92	-22.0
Rice (U.S)	265.7	-	439	271	291	-33.7
Rice (Thai)	284	226	316	207	179	-46.7
Cotton	63.5	98.2	77.5	66	49.1	-50.0
Groundnut Oil	590	991	1010	788	-	-20.5
Palm Oil	437	626	93.5	74.7	-	-88.1
Soya bean Oil	464	479	625	71.4	-	-85.1
Soya bean Seed	297	273	262	199	178	-
Soya bean Seed	110	156	111	102	99	-36.5
Sugar	10.2	13.3	11.4	10.2	9.2	-30.8
Jute	370	366	302	276	-	-24.6

ducer. Support to the cotton sector is greatest in the US, followed by China and the EU. The combined support (domestic and export subsidy) provided by the US government to cotton producers is pegged at US\$ 4 billion. The US subsidy system is based on direct payments to farmers who can sell cotton in world markets at prices well below the cost of production. Production costs are US\$ 1.70 per kg but its cotton is sold at US\$ 1.18 per kg. Export subsidies for 2005-2006 amount to US\$ 360 million.

The worst losers are farmers in the least developed countries. This subsidy is helping only a few thousand farmers in the developed nations but is putting millions of poor Africans and Indians into a death trap. For example the \$ 4 billion subsidy that the US gives is only meant for 20,000 farmers who cultivate cotton. Meantime, falling cotton prices are creating US\$ 250 million increased poverty in several central African countries such as Burkina Faso, Chad, Mali and Togo.

In India falling cotton prices driven by the removal of import restrictions are killing our farmers. Before 1990 cotton import and export was totally controlled by the central government. After the formation of WTO in 1995, cotton import and export has been free. But we could not export cotton as prices in international market had fallen to one third from what was it was in 1994. The cost of production in America of

1 kg of cotton lint is not less than US\$ 1.8. But it is sold in international market at US\$ 1.0 per kg. This is why cotton farmers in India are committing suicide.

Traditionally, India has been a net cotton exporter. But by 1998, it emerged as a major importer due to policy changes. Imports were liberalized when the Cotton Corporation of India's import monopoly was terminated in 1991. Now imports are subject to the Open General License, allowing unrestricted imports by private traders.

The story of falling prices is repeated in spices, edible oil, and dairy products. Suicides of Wynad farmers are directly connected to imports of spices. According to the Government of Kerala, falling prices have led to losses of Rs. 2958 crores for coconut farmers, Rs. 695 crores for pepper farmers, Rs. 924 crores for arecanut farmers, Rs. 388 crore for coffee growers and Rs. 178 crore for tea grower and Rs. 70 crore for cardamom growers in 2000-2001. In India, agricultural imports have gone up by 300 per cent during the last decade. While edible oil imports have increased by 398 per cent, cotton imports have multiplied by a whopping 13,153 per cent. Sugar, fruits and vegetables and spices are some other commodities that have poured in unchecked. For all agricultural commodities, our study *The Mirage of Market Access* assesses that falling prices due to imports have led to annual losses of Rs. 116200 crores of Indian farmers.



## Changing the Trade Rules

The growing agrarian crisis India is experiencing, with farmers suicides as the most tragic expression of the crisis, is a direct result of WTO rules and the trade liberalization paradigm. It is an imperative to change these rules to allow for the protection of Indian farmers against cheap imports. This requires re-introducing QR's. We also need to be able to promote national and local food security policies. Food and agriculture are issues of livelihood and basic needs, not mere matters of trade. Across the world, people are calling for removing agriculture from the WTO.

Similarly, WTO is the wrong place to create rules for intellectual property. TRIPS must also be removed from WTO. This is the suggestion from experts and the call of the movements like the '*Indian People's campaign against WTO*' convened by Mr. S.P. Shukla, who was Ambassador to GATT during the Uruguay Round.

The WTO is in deep crisis because it imposed unjust and asymmetric rules on the South. The Seattle ministerial (1999) failed because of people's resistance. The Doha Round (since 2001) was negotiated in the shadow of 9/11. Cancun (2003) failed because the South organized under the G-20, with India as a leading player, and the G-90 the group of least development countries. Hong Kong (2005) too would have failed, but this time India and Brazil joined the rich countries to produce a disastrous draft. The emptiness of the promises made in Hong Kong were born out by the failure of the WTO negotiations in July 2006.

The Doha round negotiations collapsed once again at the Mini Ministerial in Geneva on 23<sup>rd</sup> July 2006. Martin Khor of Third World Network reported from Geneva that when asked of the Doha Round is dead or in intensive care, Mr. Kamal Nath, India's Commerce Minister, said it is somewhere between intensive care in hospital and the crematorium. Peter Mandelson, the EU Trade Commissioner, told the press following suspension of WTO negotiations, "we have missed the last exit on the motorway."

The US is being identified by all as responsible for the collapse of talks, by its refusal to reduce its agricultural subsidies. The US and its corporations were the driving force behind two agreements of the Uruguay Round, which have the highest impact on the poor of the Third World. The TRIPS Agreement has increased the cost of seeds and medicine by promoting monopolies. Thousands of Indian farmers have committed suicide due to debts resulting from a new

dependence on costly yet unreliable hybrid and Bt cotton sold by Monsanto and its Indian partners. The *Agreement on Agriculture* (AoA) has destroyed agricultural livelihoods of millions of peasants and food security of the world's poor. The Deputy Chairman of the Planning Commission wants to see an "exit policy for farmers of India, which in effect means planning for the destruction of their livelihoods.

The willingness of the US to allow the Doha Round negotiations to grind to a halt by showing inflexibility in offering to reduce distorting farm subsidies in exchange for increased market access is not because agricultural market access is no longer of interest to the US. The US does not have to give up anything multilaterally because it is getting market access bilaterally, often with 'non-agreements' like the US - India Knowledge Initiative in Agriculture, which is promoting GMOs, agricultural imports and the entry of the US giant Walmart into the Indian retail. Monsanto, Walmart and ADM are on the board of the US India Agriculture Initiative.

USAid is interfering directly in India's gene modification (GM) policies and has financed the push to commercialize Bt Brinjal, which would be the first GM food crop approved for large scale commercial trials and seed production in India. While India's biosafety assessment framework has no reference to the unscientific 'substantial equivalence' principle, (a principle promoted in the US to avoid looking for the unique biological impacts of GM foods), the 'substantial equivalence' is the basis of Bt Brinjal data submitted by Monsanto-Mahyco to the *Genetic Engineering Approval Committee* (GEAC), the statutory body for granting approvals for *gene modified organism* (GMOs). The virus of biosafety deregulation is thus being subtly introduced into India. GMOs are spreading bilaterally without the WTO, which had to be used against Europe in the US - EU GMO dispute.

The US biotech agenda is also being internalized into India's agricultural policy. The Planning Commission, India's highest planning body, headed by Montek Singh Ahluwalia is appointing a non-resident, the US based Dr. Deshpal Verma, Professor of Genetics and Biotechnology at Ohio, to head a cell to promote GMOs in agriculture and to increase the role of global corporations like Monsanto in the farm sector. Bilateral deals are thus mutilating into unilateral policies referred to an 'autonomous liberalization'.

US agribusiness like Cargill and ADM do not need WTO's market access rules anymore to capture India's markets. As part of the Bush-Singh agreement, India has been influenced to import wheat, even

though there was enough wheat produced in India. And domestic markets too have been captured by MNC's like Cargill, Canagra, Lever, and ITC. India's food security is being systematically dismantled. Food prices have increased dramatically, and with it, hunger and malnutrition. While being presented as an economic power and the new poster child of globalization, India now is the home of one third of the world's malnourished children. And the problem of hunger will grow as peasants are pushed off the land and food prices increase.

Meantime, corporations like Walmart are trying to grab India's retail market, which consists of the small-scale informal sector employing more than 200 million people. Walmart is trying to get into capturing this large market and has succeeded in getting FDI pushed through in retail. It is also trying to partner with Reliance Industry Ltd (RIL), which is planning to

build new super stores in 784 Indian towns, 1600 farm supply hubs, and move the produce with a 40-plane air cargo fleet. The Reliance group has also become the largest land grabber in India, using governments to forcefully acquire hundreds of thousands of acres of fertile farmland at 1/1000<sup>th</sup> the market price. These are the subsidies Walmart is seeking through partnerships. And Walmart does not need a *General Agreement on Trade in Services* (GATS) to take over retail services in India. Bilateral and unilateral policies are opening up India's markets for Walmart. WTO might be on life support, but 'free trade' is alive and kicking.

Bilateral and unilateral, initiatives are the new avatars of globalization and free trade. And it is these avatars we must challenge to stop corporate rule, while WTO hangs between intensive care and the crematorium.

## 2 The International System, Great Powers, and Environmental Change since 1900

*J.R. McNeill*

### 2.1 Introduction

This chapter examines an aspect of the relationship between the international system and environmental change. Political scientists have recently created a new sub-field, called 'environmental security', in which they argue that environmental stresses add to security risks. Without disputing the validity of that literature, indeed complementing it, this chapter puts the matter the other way around: security risks put added stress on the environment, thereby creating something of a vicious circle. In particular, the unusually high security anxiety of the 20<sup>th</sup> century helped drive unusually rapid and large-scale environmental change since 1900. The evidence offered in support of this argument concerns nuclear weapons programmes, pollution-intensive industrialization efforts, pro-natalism, among others.

One of the major influences upon modern environmental history has been, and remains, the struggle for survival and power in the international system. This chapter argues that historically international struggle has generally selected against ecological prudence in states and societies, and that the rigorous struggle of the 20<sup>th</sup> century selected rigorously against ecological prudence. Further, it argues that preparation for war and economic mobilization for war had stronger environmental consequences than did combat itself. After brief consideration of the scale and scope of environmental change and its causes (2.2) and of the evolution of the international system (2.3), the chapter focuses on environmental impacts of war and preparation for war (2.4).

### 2.2 Environmental Change and Its Causes in the 20<sup>th</sup> Century

Environmental change has always been part of the human experience. Since they first harnessed fire sev-

eral hundred thousand years ago, hominids and humans have changed the world's ecology. But in modern and contemporary times we have done so on a scale unprecedented in human history and with very few analogues in earth history. Humankind undertook a gigantic, uncontrolled experiment on the earth, altering land cover, atmospheric chemistry, biodiversity, biogeochemical flows, and much else (McNeill 2000; Steffen et al 2005, see table 2.1).

Why did this tremendous flux occur when it did and how it did? The reasons are many, complex, and overlapping. Population growth, often cited as the principal driving force behind all manner of environmental change, did indeed matter. The expansion of human numbers from about 1.5 billion in 1900 to about 6.3 billion in 2005 is obviously unprecedented, destined never to be repeated, and replete with environmental consequences. But the energy system mattered even more. First, because it was based on fossil fuels: after 1890 they provided more than half of the energy used around the world. Fossil fuels are dirty. The carbon dioxide they emitted into the atmosphere promoted climate change. The sulphur dioxide they emitted fell as acid rain, damaging the biota of rivers and lakes, and possibly damaging forests as well. But the pollution consequences of burning fossil fuels were only part of the larger picture. Digging coal, drilling for oil, and transporting oil were messy affairs too. Fossil fuels allowed new technologies that exponentially increased the volume and pace of mining, to the point where it became rewarding to shear off mountain tops in search of coal, or to crush millions of tons of rock in quests for a few grams of gold. Fossil fuels allowed the chain saw, without which tropical deforestation, so characteristic of our times, could not have taken place nearly so quickly. And of course fossil fuels are not the only component of the 20<sup>th</sup> century's energy system: hydroelectricity required dam building, often done on the gigantic scale; and nuclear energy, with its accidents

**Table 2.1:** Co-efficients of Change, from the 1890's to the 1990's.

Indicator	Coefficient of change
World population	4
Urban proportion of world population	3
Total world urban population	13
World economy	14
Industrial output	40
Energy use	13-15
Coal production	7
Oil production	240
Carbon dioxide emissions to atmosphere	15
Carbon dioxide concentration in atmosphere	1.3
Sulphur dioxide emissions to atmosphere	13
Lead emissions to atmosphere	8
Freshwater use	9
Marine fish catch	35
Cattle population	4
Pig population	9
Goat population	5
Sheep population	1.8
Horse population	1.1
Cropland	2
Pasture area	1.8
Irrigated area	5
Bird and mammal species	0.99 (1 % decrease)
Fin whale population	0.03 (97 % decrease)
Blue whale population (Southern Ocean only)	0.0025 (99.75 % decrease)

**Source:** McNeill 2000: 361-2; see: Dutch Ministry for the Environment (RIVM), at: <<http://arch.rivm.nl/env/int/hyde/index.html>>.

and waste storage problems, had significant ecological effects too, although so far rather less calamitous than often feared.

The ideological fixations of modern times have also contributed to the pattern of twentieth-century environmental history. Under the tutelage of the economists, and inspired by routine self-interest, pub-

lic servants and private individuals consistently sought to foment economic growth and secure monetary gain. They regarded the natural world as a storehouse of raw materials, without intrinsic worth. They saw little value in such abstractions as balance, stability, or resilience in ecosystems. The reigning ideas about appropriate individual and state behaviour promoted rapid environmental change, and justified it in the name of various higher goals: economic growth, political stability, social mobility. The environment changed so much because prevailing ideas changed so little.

These were the most important reasons why the 20<sup>th</sup> century had the environmental history that it did (McNeill 2000: 267-356). But there were others, among which was politics. It was conventional politics, not environmental politics that mattered most. Even after 1966, when countries began to create environmental agencies, departments, and even ministries, real environmental policy was made elsewhere, in the powerful branches of government: e.g. the ministries of finance, trade, industry, and defence. In every country at all times these were more powerful than the environment ministry (or department or agency), and they made de facto environmental policy as accidental by-products of their own affairs. One concern they all shared, to greater or lesser degrees, was 'state security'. It is this I shall focus on here, only a part of the overall picture.

### 2.3 The International System and Its Imperatives

The quest for 'state security' has been in force, and affecting ecology, since states were first organized.<sup>1</sup> Throughout most of the history of states, however, the rigour of state security concerns has been blunted by the success of large empires. Most people lived in circumstances either of imposed peace managed and maintained by the technocrats of a bureaucratic empire, or else in an anarchic world in which states can scarcely be said to have existed. Enduring systems of competing states – the international anarchy we tend to regard as normal – have been rare. Typically, they quickly collapsed into imperial unification or reunification. Notable and durable exceptions include the era of warring states in China (c. 770 BC to 221 BC) and Greece from the first *poleis* (ca. 800 BC) to Alex-

1 Westing (1980: 14) provides a list of 26 wars with a capsule description of their ecological cost.

under the Great's unification (336 BC). In these times and places interstate struggle doubtless took its toll on landscapes, although details are obscure.<sup>2</sup> But in these cases the scales of military and bureaucratic operations were comparatively small, and the technologies involved rudimentary. Consider the technology of destruction. Before 1800 the only powerful means of ecological damage were deliberate fire and the capacity to tear apart irrigation works, causing deliberate floods. So the ancient eras of anarchic competition in international systems were limited in their ecological impact. Modern times have seen the resurgence of international anarchy combined with ever-growing scales of operations and technological sophistication.

The current competitive international system has not yet collapsed or unified, but instead has evolved and grown so as to be effectively global. It originally emanated from the stalemate in sixteenth-century Europe among the Hapsburg, Valois, and Ottoman dynasties. None succeeded in re-establishing a pan-European empire, which eccentricity marked Europe off from the rest of the world. This extraordinary failure was codified by the Peace of Westphalia in 1648, and a self-consciously self-regulating system of competing states was born, ratcheting up the rigour of intersocietal and interstate struggle. The constant competition of this system obliged (surviving) European states to evolve ever more formidable political, fiscal, and military capacities, which by the nineteenth century created states more powerful than those anywhere else in the world.

But in the 19<sup>th</sup> century (1815–1910) the Great Powers managed their competition almost peacefully, thanks to diplomatic skill, a fairly stable balance of power, and British economic and naval hegemony. In effect they almost banished war to Asia and Africa (and various frontiers in the Americas), where it prevailed with heightened regularity in part because of colonial pressures from the Great Powers. These conflicts required minimal mobilization on the part of the Great Powers: colonial wars were cheap, mainly because of technological and organizational edges enjoyed by European states, but also because they often

were fought by colonial troops. But the situation changed with the rise of a united Germany after 1870, and acutely when German industrialization allowed greater German assertiveness after 1890. So the 20<sup>th</sup> century would be different, an era of high anxiety for great powers, beginning with the run-up to World War I.

In the 20<sup>th</sup> century the rigour of struggle ratcheted up on account of the mounting requirements of competitiveness and the heavy costs of defeat in an age of total war. By 1914, only an all-out effort gave any chance of survival in the European international system; by 1939–45, losers in the competition risked annihilation. Higher stakes brought forth more strenuous effort and greater disregard for goals other than immediate political and physical survival. By 1945–90 even peacetime seemed to require the utmost preparedness for war. The international system selected for those characteristics that promised power in the present moment: technological sophistication, mass industrial and agricultural production, and ideological conformity (on fundamental questions at least, and in some societies on more than that). The health of soils, waters, and air took a distant back seat.

## 2.4 International Struggle and Environmental Change

Intersocietal competition affected the environment directly through warfare and less directly through the preoccupation with military power: that is, through war and through preparation for war.

### 2.4.1 The Deeper Past

Until the 20<sup>th</sup> century, combat did not produce vast environmental consequences except in extraordinary circumstances. When men fought with clubs, spears, arrows, swords, lances, pikes or muskets, they could do little to landscapes. Indeed, the more destructive wars so disrupted agriculture that they produced a fallowing effect, as in Brittany in the 100 Years' War, or in Germany during the Thirty Years' War.<sup>3</sup> Forests and wildlife recovered when and where farmers and herders could not conduct their daily business. So did fisheries when naval war, pirates, or privateers confined fishermen to port. The built environment, of course, has always been vulnerable to destruction in war, usually through fire. Victors have torched countless cities; retreating armies have scorched earth aplenty. The Mongols, in their thirteenth-century

2 In the Second Punic War the Roman efforts to defeat Hannibal led to ecological damage in southern Italy that, according to one observer, was visible more than 2,000 years later (Toynbee 1965, II: 11–35). Caesar's legions energetically burned the forests of Gaul (Demorlaine 1919; Corvol/Amat 1994). For the ecological consequences of political-military struggle in ancient China see Elvin 2004.

conquest of Iraq, devastated a flourishing irrigation network, flooding arable lands, creating (or re-creating) swamps. While the Mongols' efforts edged Iraq more nearly to a state of nature, from the cultivators' point of view – not initially shared by the Mongols – this was environmental damage on a large scale.<sup>4</sup> From any point of view it amounted to vast and enduring environmental change. But such cases were quite rare, essentially confined to landscapes of irrigation.

Preparation for war, rather than combat, typically provoked more serious environmental changes. In Europe for instance, the navy-building programmes of Venice and Genoa in the 11th through 16th centuries, and then of Britain, France, and Spain in the 17th and 18th centuries severely depleted the supply of tall fir and spruce and stout oak in Mediterranean and Atlantic Europe. All states developed forest conservation programmes so as to save more specialized timber for navies, but this proved inadequate in every case. By the 18th century Europe's wooden navies sought ship timber in Indonesia, India, Brazil, Canada and elsewhere around the world (Appuhn 2000; Merino Navarro 1981: 181–267; Albion 1926; Bamford 1956; Lane 1965; Miller 2000).

#### 2.4.2 Combat's Environmental Consequences in the Twentieth Century

In the 20th century, while the technology of destruction grew vastly more powerful, preparation for war, as in remoter times, wrought greater and more lasting environmental change than did war itself. The direct environmental effects of warfare since 1914 have been vast but usually fleeting. The battle zones of WWI's western front created small deserts, where little but rats, lice, and men could live – and few men lived for long. But these zones are hard to detect today, except where carefully preserved: elsewhere their recovery

and assimilation to the French and Belgian countryside is nearly complete. The more mobile campaigns of WWII produced less concentrated damage to landscapes (except for cities),<sup>5</sup> although certain episodes were destructive enough. For example, in 1938 Chinese troops, in an effort to forestall Japanese advance, deliberately breached the dikes that held the Hwang Ho in place, flooding broad areas of North China and killing people (almost all Chinese), drowning crops, sweeping away bridges, roads, over 4,000 villages and millions of tons of soil: a disaster to be sure, but one soon made invisible by the careful labour of millions of Chinese peasants.<sup>6</sup> By 1947 the Hwang Ho dikes were repaired. The 'war erosion' of the Russian and Ukrainian plains (1941–45) is perhaps the next greatest example of combat-derived environmental change (cities excepted) from WWII, and in the grand sweep of Soviet soil history it ought probably to be considered trivial (Sobolev 1947; Alayev/Badenkov/Karavaeva 1990). In general, the theatres of operations in World War I and II involved ecologically, economically, and socially resilient places, so the environmental impacts of combat lasted comparatively briefly. Bomb craters remain here and there, forests are still recovering, and the destabilizing effects of tank tracks on dunes in the North African desert linger, but very little of significance in the way of combat-derived environmental change will prove lasting.

The environmental impact of the 1991 Gulf War, a subject viewed with great alarm at the time because of its conspicuous oil fires and spills, now seems not as great as many first feared. It is too soon to comment on its durability, which for marine ecosystems at least may prove considerable. About 10 million barrels of oil flowed into the Gulf, the equivalent of 40 Exxon Valdez spills. The fires, despite initial alarms, appear to have had a negligible impact on the atmosphere and climate (Westing 2003; Hawley 1992; Hobbs/Radke 1992). In Kuwait the war enriched desert environments. So much lethal ordnance remained amid the shifting sands of the Kuwaiti desert that all prudent Kuwaitis refrained from pre-war pastimes of hunting and joyriding. Bird populations grew

3 See: Cintre (1992: 119–127). Between 1420 and 1440 the Breton marches lost 20–80% of their population, almost all settled land was abandoned for decades and returned to second-growth forest. See also: Duby (1968: 296–302), where he says the 100 Years' War led to a resurgence of forest in wide areas throughout France. On the Thirty Years War, see Makowski and Buderath (1983). I am grateful to David Blackbourn for this reference.

4 The Mongols did rebuild the water system in Baghdad and eventually saw the attractions of higher revenues from irrigated farming. Details can be found in Christensen (1993).

5 Hewitt (1983) reports that about 750 square kilometres of German and Japanese cities were flattened by aerial bombing in WWII.

6 The Dutch used a similar tactic to forestall a French invasion in the 1670's, inflicting great flood damage on their own country, and many marauding or occupying armies have purposely flooded other people's lands.

a hundred-fold after the war. Grasses flourished to the point where they reminded some observers of prairies. Similar, if temporary, consequences arose from the desert campaigns in Libya and Egypt in 1942-3.<sup>7</sup> Thus, in exceptional cases the heavy use of explosive ordnance in conventional war has permitted more rapid recovery from environmental damage.

One perhaps durable effect of the 1991 Gulf War is the near elimination of the marshes that for several millennia had spread over the lower reaches of the Tigris-Euphrates. These were home to people disloyal to Saddam Hussein in his war with Iran in the 1980's, and who rose in revolt against him in 1991. They were crushed. As a coup-de-grâce, the Iraqi dictator ordered the draining of the marshes beginning in 1993 (based on a plan drawn up in 1989), a form of ecological warfare that destroyed birds, fish, reed beds and a way of life for a few hundred thousand people. Attempting to destroy the ecological and economic basis of life of one's enemies is a practice with a long pedigree. In the twentieth century, energy-intensive machinery made such projects far easier than in times past. In this case, with the fall of Saddam, it is possible that engineers will attempt to create the marshes anew. If they succeed, the episode of the Iraq marshes will be just another case of fleeting environmental damage from war (Nicholson/Clark 2002).

#### 2.4.3 The Impacts of Guerrilla War

As a rule, more enduring environmental change came from the guerrilla wars of the 20<sup>th</sup> century. They were disproportionately important in environmental change because they invariably involved systematic attempts at habitat destruction, similar to that which Saddam Hussein undertook from 1993. Guerrillas inevitably sought to hide from the firepower of their enemies, and except in urban settings that meant hiding in forest and bush. After the dawn of air reconnaissance and bombing (the 1920's, practically speaking), hiding in remote areas proved insufficient: vegetation cover was required. Those fighting against guerrillas found it expedient to destroy that vegetation.

In some instances, this produced durable consequences for vegetation and soils, notably in drier, mountainous regions with high erosion potential, such as those around the Mediterranean. The anti-guerrilla campaigns in the Rif Mountains of Morocco (1921-26), in the mountains of north-western Greece (1942-49), and in the Algerian Tell (1954-61) all entailed widespread forest burning, often through air power. All these wars left scars still visible today, and reduced both the biomass and the economic potential of these districts (McNeill 1992). The consequences may last for centuries. The numerous wars in Africa since 1970, often intersocietal but not international, have led to heightened rates of desertification and ecological damage of many sorts. These too are likely to be durable in their effects, as for climatic, geological, economic, and social reasons the resilience of the affected ecosystems is weak. Ethiopia is perhaps the saddest example of this, but much the same situation prevails in Mozambique, Angola, Chad, and Somalia (Kreike 2004; Timberlake 1987: 162-173; Rubenson 1991). In Vietnam, where defoliation figured prominently in American tactics, the durable results of war are less conspicuous but no less real: geology, climate, and human agency have combined to permit quick repair of most but not all of the damage. Bomb craters (about 20 million all told) and deforested zones remain throughout the country, testament to the American anti-guerrilla effort (Westing 1976, 1984; De Koninck 1999). Guerrilla wars in Central America in the 1970's and 1980's also accelerated forest clearance and added to the chemical poisoning of waterways (Rice 1989; Faber 1992).

#### 2.4.4 Impacts of War Refugees

Additionally, both conventional and guerrilla warfare routinely disrupted local ecologies through the mass migration of refugees. As thousands or millions left war zones, their impact in disturbing or managing their home environments was lost. This at times proved ecologically helpful, but in some cases, such as terraced mountains, mass emigration led to accelerated erosion because terraces fall apart without constant upkeep. Whatever the consequence of war refugees' departure, their arrival somewhere else almost always proved stressful, ecologically as well as in other respects. A careful study of the environmental effects of 3.5 million Afghan refugees in northwest Pakistan in the 1980's provides a grim picture. Suddenly heightened demand for arable land and fuel wood, and the Afghans' inevitable ignorance of local ecol-

7 Reported anonymously in *Environment* (35,4, May 1993: 22); on Egypt and Libya: Said 2003, who recounts tragic consequences of lingering landmines in Egypt; and Westing (1980: 110). Westing (1980: 154) also reports parallel events in the North Atlantic fisheries, where WWII temporarily halted harvesting, and so stocks flourished until peace permitted renewed fishing.

ogy, combined to devastate Pakistan's largest remaining forest zone (Allan 1987). Africa's decolonization and postcolonial conflicts since the 1950's created refugees in their millions, obliged to occupy landscapes which they often understood poorly and in which they hoped to have no long-term stake.

Previous centuries of course featured war refugees. But the twentieth century was distinctive for the number of refugees (~30 million in the 1990's), greater than in the past because human numbers grew so much greater, and because warfare became much more dangerous. Moreover, only rarely in the 20<sup>th</sup> century could war refugees find unoccupied lands into which to move; much more often they had to crowd into landscapes already thickly settled. Thus their impacts were probably greater because ecological buffers had already been worn thin in the lands obliged to accept them (Jacobsen 1994; Westing 1994).

#### 2.4.5 Impacts of Preparation for War

Combat in general, whether guerrilla or conventional, even including refugee impacts, had a lesser impact than the business of war production and preparing for war. This was because more societies prepared for war than actually fought wars; because many societies saw fit to maintain their preparedness for decades on end, while wars themselves were (usually) comparatively brief; and because most of the big economies and populous societies were deeply involved in the geopolitical turmoil of the 20<sup>th</sup> century. It was also true because, with the transportation systems and integrated markets that had developed since 1870 or so, the demand for war materiel, and thus the impacts of economic mobilization for war, reached into nearly every nook and cranny of the globe.

Preparedness for war implied maximizing immediate production, putting much of it at the disposal of the state, and mobilizing as much labour as quickly as possible. Powers great and small sacrificed the quality of their soils, waters, and urban air in concentrated efforts to maximize production and stockpiles of food, rubber, oil, steel, uranium, soldiers, and other strategic substances. In the First World War the British government encouraged farmers to plough every imaginable acre. Labour shortage prevented farmers from caring for their lands as they would have wished. British grain production increased by 30 per cent in the course of the war, but much marginal land was damaged in the process (Horn 1984). Britain's

war efforts of course extended to the Empire, to Australian wheat fields, Canadian forests, and South African mines. During WWII in colonial Southern Rhodesia (now Zimbabwe), for example, the British revived the practice of forced African labour on white settlers' farms, trying to maximize production of food and tobacco, and bled the African farms of their labour supply. African farms thus lacked the labour needed to manage soils and wildlife, while settlers' farms extended cultivation at the expense of surrounding bush (Johnson 2000).

Fascist states regarded preparation for war during peaceful interludes as a sacred duty. In the 1920's, Mussolini, well informed about food shortages in Germany and Austria in the latter stages of World War I, thought that Italy needed to be self-sufficient in grain. He launched a 'Battle for Wheat', and did not care that this policy promoted forest clearance of sloping and otherwise marginal lands, accelerating the erosion of Italian soils over subsequent decades.<sup>8</sup> He also tried, with scant success, to make Italy energy-independent, which involved promoting dam-building in the Alps for hydropower.

Crash programmes of economic mobilization proliferated in wartime and in times when war loomed on the horizon. Such programmes often amounted to a form of environmental roulette, but societies, whether fascist and militarist in orientation or merely anxious about war, played willingly because the ecological bills fell due much later than the political and military ones did.

#### 2.4.6 Military Pro-natalism

International competition encouraged maximization not merely of food and energy harvests, but of the human crop as well. Emperors and kings for many centuries typically encouraged reproduction, in part because they wanted to ensure a ready supply of army recruits. Modern states sometimes made it a staple of policy. Fascist Italy, Third Republic France, Ceausescu's Romania, Mao's China and the Syria of Hafez al-Assad all sought to raise birth rates in order to provide more troops to fight possible enemies: military pro-natalism. Normally populations have responded desultorily to their leaders' efforts to get them to re-

8 Mussolini may have had an equally unintended impact, this time beneficial, upon Italian landscapes, by his campaign to reduce the populations of Italian goats. He regarded the goat as an unfascist animal (McNeill 1992).



produce more exuberantly. Romanians under the dictator Nicolae Ceausescu were the great exception, a product of special circumstances. In 1965 Romania was very much a Soviet satellite, but Ceausescu had in mind a rather more independent foreign policy than Moscow wished. He concluded that Romania needed more people, preferably 30 million by the year 2000, so he banned all forms of birth control and abortion. He set his secret police the task of ensuring that Romanian women were not shirking their reproductive duties. Romania's birth rate doubled in 1966, before tapering off. After Ceausescu's overthrow in 1989, women went on a reproduction strike, so Romanians fell well short of the population target he set (Kligman 1998; Chesnais 1995: 171-8).

Mao, like Ceausescu, usually thought more people meant more security. From the time of the Korean War (1950-53) he anticipated a nuclear attack by the Americans, which was not a far-fetched fantasy since General Douglas MacArthur in 1951 recommended just that. After the Sino-Soviet split in 1958, Mao also feared nuclear attack from the Soviets. He concluded that China's best defence lay in raising its population so that it could better withstand nuclear war. For Mao, a large population was China's way to combat technologically more advanced enemies. He surprised Nikita Khrushchev in 1957 with his views:

We shouldn't be afraid of atomic missiles. No matter what kind of war breaks out - conventional or thermo-nuclear - we'll win. As for China, if the imperialists unleash war on us, we may lose more than 300 million people. So what? War is war. The years will pass and we'll get to work producing more babies than ever before (Khrushchev 1974: 255 quoted in Shapiro 2001: 32).

Mao's successors were horrified by the rapid population growth Mao encouraged, and in 1976 turned to the most restrictive birth control programme ever implemented. The 20<sup>th</sup> century witnessed many other cases of military pro-natalism, a policy which, when successful, could lead to imbalance between population and environment, over-intensive resource exploitation, environmental degradation, and perhaps a higher probability of war.

#### 2.4.7 Military Industrialization

Most states, however, recognized early in the 20<sup>th</sup> century that military power rested on industrial might more than upon massive population. Several shuffled their priorities accordingly, building military-industrial complexes. The British and Germans began this

policy in the 19<sup>th</sup> century, and were soon imitated by the Japanese. The lessons of WWI, in which the Russian army lacked the necessary armament to fight the Germans effectively, drove home the importance of having one's own heavy industry. So from WWI onwards all great powers, and some not-so-great, encouraged the emergence of metallurgical and armaments industries within their national territories, and their empires. These industries, inevitably, involved heightened levels of air and water pollution. Further, they intensified resource use, especially of coal and iron, with attendant environmental effects from mining.

The most dramatic examples came where the state enjoyed maximal latitude to direct economic development, as in Stalin's USSR and Mao's China. In both cases security anxiety helped to motivate heroic, overnight industrialization campaigns (which in both cases had other motives as well). The dirty industrialization of the USSR beginning in 1929 reflected Stalin's fear that his country would be crushed by its enemies if it did not become an industrial power within ten years. He was correct in this assessment, although it is certain that sufficient industrialization to resist Hitler could have been achieved at lower environmental (and human) cost than Stalin was prepared to exact.

After the defeat of the Germans in 1945 the Soviets embarked on grand plans for the harnessing of nature in the service of the state, formalized in the 1948 "Plan for the Transformation of Nature" (Josephson 2002: 28). The deepening Cold War made it seem necessary that no drop of water should flow to the sea unused; no forest should be left unharvested. Giant hydroelectric dams served as the centrepiece of this plan, but it involved a comprehensive restructuring of the USSR's ecology. Cost constraints prevented Stalin and his successors from realizing their most grandiose ambitions: The Soviets never managed to divert the Siberian Rivers to Central Asia, or reroute the Pacific Ocean's Japan Cold Current. But they built a sprawling military-industrial complex with very few checks on pollution, and kept secret the environmental and health consequences of their efforts (Josephson 2002; Weiner 1999; Feshbach/Friendly 1992).

In 1958 the Chinese embarked on an industrialization that was even dirtier than the Soviet effort. Mao had become fixated on the idea of surpassing British steel production, and encouraged Chinese peasants to make steel in their backyards. They made plenty of steel, most of it useless, and in the process acceler-

ated the deforestation of China in their quest for fuel for their tiny smelters (Shapiro 2001). After Mao's death in 1976, China continued its industrialization programme, although in more conventional forms.

Meanwhile, South Korea and Taiwan proceeded apace with their own pollution-intensive industrializations, nurtured by the Americans, whose interest in economic development in East Asia was mainly geopolitical. The American security agenda required the rapid industrialization of its East Asian allies to counter the emergence of China. All of these efforts, capitalist or communist, were notably successful except for Mao's Great Leap Forward. In every case, pollution levels and other environmental concerns carried a very low priority until about 1990. And in every case, especially the Great Leap Forward, the environmental consequences proved unfortunate.

In the United States a military-industrial complex emerged in the 20<sup>th</sup> century too, although there top-down state planning played a much smaller role. And domestic, non-military demand was so strong that the steel mills of Pittsburgh and Gary, along with the coalmines of West Virginia and Wyoming would have thrived even without security anxiety. Nonetheless, tentatively and temporarily in WWI, and exuberantly from 1942 onward, the American state subsidised and otherwise encouraged military industry, adding a filip to the demand for steel, coal, bauxite, nickel, electricity and other enterprises, all of which carried profound ecological consequences.

#### 2.4.8 Militarily Useful Transportation Infrastructure

Beyond the more or less direct environmental impacts of industrialization and weapons programmes, there are indirect environmental consequences of state actions driven, at least in part, by security anxiety. Consider transport infrastructure. German railroads, the trans-Siberian railroad, Brazilian Amazonian highways, the Karakoram Highway connecting Pakistan and China, and even the U.S. Interstate system were built partly or entirely for military reasons.<sup>9</sup> Each investment in rails or roads led to rapid economic change (generally regarded as beneficial),

9 See: The Economist, 10 October 1992, recounts the story of Eisenhower's 1919 cross-country convoy drive and his role in establishing the federal interstate highway programme in 1956. He also admired the military potential of Germany's autobahns in the campaigns of 1945.

rapid social change (often controversial), and unanticipated environmental change (normally ignored). People and businesses flocked to the new roads and railroads, almost like iron filings to a magnet. The U.S. Interstate system strongly affected land use, population distribution and densities, and, through promoting trucking and automobile travel at the expense of rail transport, air quality and energy use. It is true, of course, that highways and railroads also exist in places where military motives played no role in their construction. In light of this it is fair to say that, in contrast to nuclear weapons, the world's networks of roads and railroads would exist approximately as it is even absent security anxiety. The point here is a limited one: the extent, location, and timing (of construction) of much of the 20<sup>th</sup> century's transport infrastructure had military motives, and that in myriad ways transport infrastructure affects the environment.

#### 2.4.9 Nuclear Weapons Industry

The starkest illustration of how security anxiety propelled the great powers to indulge in reckless environmental change comes from the nuclear weapons programmes of the U.S. and USSR. No component of the world's military-industrial complexes could rival nuclear weapons for state support, for freedom of action with respect to environmental consequences, and for protection from public and press scrutiny.

The American nuclear weapons complex was born in 1942 and by 1990 involved some 3,000 sites in all. The U.S. built some 70,000 nuclear warheads, and tested more than a thousand of them, mainly in Nevada and on small Pacific atolls.<sup>10</sup> The jewel in the nuclear weapons crown was the Hanford Engineering Works, a sprawling bomb factory on the Columbia River in the bone-dry steppe of south-central Washington State. It built the bomb that flattened Nagasaki in 1945. Over the next 50 years, Hanford engineers intentionally released billions of gallons of low-level radioactive wastes into the Columbia River, and accidentally leaked some more into groundwater. In 1949, shortly after the Soviets had exploded their first atomic bomb, the Americans conducted a secret experiment at Hanford. The fallout detected from the Soviet test prompted questions about how quickly the Soviets were able to process plutonium. In response, American officials decided to use 'green' uranium, less than 20 days out of the reactor, to test their hy-

10 Figures from: Brookings Institution, see at: <<http://www.brook.edu/FP/PROJECTS/NUCW/COST/50.HTM>>.

potheses about Soviet activities. The 'Green Run', as it was known to those in on the secret, released nearly 8,000 curies of iodine-131, dousing the downwind region with radiation at levels varying between 80 and 1,000 times the limit then thought tolerable. The officially tolerable limit has been lowered since then. The local populace learned of these events in 1986, when Hanford became the first of the US nuclear weapons complexes to release documents concerning the environmental effects of weapons production. The 'Green Run' shows the environmental liberties the Americans took under the influence of Cold War security anxiety.<sup>11</sup>

That was the tip of the iceberg. More environmentally serious were the wastes, which in the heat of the Cold War were left for the future to worry about. A half century of weapons production around the U.S. left an archipelago of contamination, including tens of millions of cubic meters of long-lived nuclear waste. More than half a ton of plutonium is buried around Hanford alone. No one has yet devised a technically feasible and politically acceptable solution to the environmental problems posed by the American nuclear weapons industry (Fioravanti/Makhijani 1997; US Department of Energy 1995).

The Soviet nuclear program began with Stalin, who wanted atomic weapons as fast as possible, whatever the human and environmental cost. The Soviet command economy was good at such things: a large nuclear weapons complex arose from nothing in only a few years. Soviet engineers built about 45,000 warheads and exploded about 715 between 1949 and 1991, mostly at Semipalatinsk (in Kazakhstan) and on the Arctic island of Novaya Zemlya. They also used nuclear explosions to create reservoirs and canals, and to open mine shafts. In 1972 and 1984 they detonated nuclear bombs to try to loosen ores from which phosphate (for fertilizer) was derived. They experimented with nuclear explosions as a means of salt mining. They dumped much of their nuclear wastes at sea, mostly in the Arctic Ocean, some of it in shallow water. They scuttled defunct nuclear sub-

marines at sea. Most of the world's known reactor accidents befell the USSR's Northern Fleet, based at Archangel.

The Soviets had only one centre for reprocessing used nuclear fuel, at Mayak in the upper Ob basin of south-western Siberia, now easily the most radioactive place on earth. It accumulated 26 metric tons of plutonium, 50 times Hanford's total. From 1948 to 1956 the Mayak complex dumped liquid radioactive waste into the Techa River, an Ob tributary, and the sole source of drinking water for 10,000–20,000 people. Some 124,000 people in all were exposed to heightened radiation in this way. After 1952, storage tanks held some of Mayak's most dangerous wastes, but in 1957 one exploded, raining 20 million curies down onto the neighbourhood – equivalent to about 40 per cent of the radiation released at Chernobyl. About 270,000 people lived in the contaminated territory. After 1958 liquid wastes were stored in Lake Karachay, a shallow pond some 45 hectares in area. In 1967 a drought exposed the lakebed's radioactive sediments to the steppe winds, sprinkling dangerous dust, with 3,000 times the radioactivity released in the 1945 bombing of Hiroshima, over an area the size of Belgium and onto a half million unsuspecting people. By the 1980's, anyone standing at the lakeshore for an hour received a lethal dose of radiation (600 roentgens/hour). A former chairman of the USSR's Supreme Soviet's Subcommittee on Nuclear Safety, Alexander Penyagin, likened the situation at Mayak to 100 Chernobyls. No one knows the extent of contamination in the former USSR because the nuclear complex was so large and so secret. Much of the complex was shut down in the last years of the USSR, but the mess remained and post-Soviet Russia and Kazakhstan could not afford to clean it up even if the technical and political obstacles to doing so were overcome (Egorov/Novikov/Parker/Popov 2000; Yablokov 1995; Bradley 1997; Josephson 2000; Cochran/Norris/Suokko 1993).<sup>12</sup> The lethal residues of the British, French, Chinese, Indian, Pakistani, Israeli, South African (and perhaps a few other) nuclear weapons programmes were, mercifully, not on the superpower scale (Danielsson/Danielsson 1986; Makhijani/Hu/Yih 1995).

Taken as a whole, the nuclear programmes of the great powers left a remarkable legacy. They burdened

11 Details of this episode are in Caufield (1990) and Gerber (2002). In arguing that the U.S. ought not to adhere to radiation guidelines approved by the International Commission on Radiological Protection, one American nuclear mandarin in 1958 said, "the nation's security may demand the exposure of people to higher levels of radiation than those just established by the International Commission" (Caufield 1990: 130). See also Gephart (2003) for a detailed discussion of Hanford.

12 A useful general study of the Soviet nuclear weapons program to 1956 is Holloway (1994). The latest general report on Russian nuclear issues is Kurdrik, Digges, Nikitin, Bohmer, Kuznetsov and Larin (2004)

posterity with an apparently intractable long-term waste-management obligation. They exploded about 400 atomic devices above ground after 1945, sprinkling some 200 million tons of radioactive material around the earth. Underground testing irradiated chambers in the earth's crust. Moreover, undersea testing, practiced by the French in Polynesia, leaked plutonium into the Pacific (Danielsson/Danielsson 1986). The magnitude of these leaks remains secret, but their durability is well-known: plutonium's half-life is 24,000 years. Nuclear weapons programmes also gobbled up nearly a tenth of the commercial energy deployed worldwide after 1940 (Smil 1994: 185). The environmental changes resulting from nuclear weapons production and testing, which will persist long after the wars and tensions of the 20<sup>th</sup> century are forgotten, were driven exclusively by international security concerns.

## 2.5 Conclusion

In most societies, politics, institutions, and mentalities have evolved so as to provide security as their foremost goal. This has been truer since about 1910 than at most times in the deeper past. Hence, our politics and institutions are ill-adapted to the complex demands of ecological prudence, in which everything is connected to everything, and everything is always in flux. In Darwinian terms, the international security anxiety of the 20<sup>th</sup> century selected for states and societies that emphasized military power and industrial strength over all else: survival of the dirtiest.

When the ecology movement gathered force, in the 1970's, it did so in a moment of detente, which provided an opening for other items on political agendas. Since then it has flourished best in societies with minimal risks of war. Ecological concern on the part of states remained hostage to fortune.<sup>13</sup>

In 1990 when the war clouds were gathering over the Persian Gulf, President George Bush asked the American Congress to exempt the military from all environmental laws, and Congress complied. After 2001, his son asked that oil companies be allowed to drill for oil in the Arctic National Wildlife Refuge in Alaska, on the grounds that in time of war Americans cannot let caribou get in the way of strategic require-

ments. And in March 2003, as the U.S. prepared to attack Iraq, the President and Secretary of Defense pressed Congress for a permanent, blanket exemption from environmental regulations for the American military. The 20<sup>th</sup> century's pattern, in which great power security anxiety put a ceiling on environmental preservation and actively fomented ecological change, bids fair to hold in the 21<sup>st</sup> as well.

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13 Britain relaxed its air and water pollution regulations during WWII in hopes of spurring industry to greater production levels; indeed coal smoke over cities served military purposes because it made it harder for German bombers to see their targets.